REMARKS

The Office Action dated July 30, 2002 has been carefully considered and this Reply and Amendment prepared in response thereto. Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the following remarks.

Claim 1 is deleted, claim 15 is added, and claims 2 – 13 are amended. After amending the claims as set forth above, claims 2 – 15 are now pending in this application. New claim 15 replaces deleted claim 1, and therefore new claim 15 should be considered generic to the species elected (Group 1, claims 1 (now 15) through 8 and 10 through 13) in Paper No. 6.

In the Office Action, the specification itself, and in particular several paragraphs, were objected to under 35 U.S.C. § 112 for failing to adequately disclose and enable the invention, and on that basis claims 1 – 8 and 10 – 13 were rejected under 35 U.S.C. § 101 for being inoperative and lacking utility. Similarly, claims 1 – 8 and 10 – 13 were rejected under 35 U.S.C. § 112, 1st paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Additionally, the claims were individually rejected on the following grounds:

(1) Claims 4, 5, 7 and 10 were rejected under 35 U.S.C. § 112, 2nd paragraph as being indefinite;

(2) Claim 1 – 4 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 5,087,408 to Tominaga in view of either Japan Pat. No. JP 59-99393 to Morishita or an article by Forsberg in Nuclear Technology, Vol. 76 in further view of U.S. Pat. No. 3,475,272 to Fortescue;

(3) Claims 1 – 4 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Japan Pat. No. JP 2-115793 to Komogawa in view of Morishita and in further view of Fortescue;

(4) Claims 5 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tominaga in view of either of the Morishita – Forescue combination or the Forsberg – Forescue combination in further view of U.S. Pat. No. 5,087,409 to Wedellsborg;

(5) Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over either of the Tominaga – Morishita – Forescue – Wedellsborg combination or the

Tominaga – Morishita – Forsberg – Wedellsborg combination in further view of U.S. Pat. No. 4,644,780 to Jeter;

(6) Claim 11 was rejected under 35 U.S.C. § 103(a) as being unpatentable over either of the Tominaga – Morishita – Forescue – Wedellsborg – Jeter combination or the Tominaga– Forsberg – Wedellsborg – Jeter combination in further view of German Pat. No. DE-2144445 to Bunge;

(7) Claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over either of the Tominaga – Morishita – Forescue – Wedellsborg – Jeter – Bunge combination or the Tominaga– Forsberg – Wedellsborg – Jeter – Bunge combination in further view of U.S. Pat. No. 5,610,962 to Solozano;

(8) Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over either of the Tominaga – Morishita – Forescue – Wedellsborg – Jeter – Bunge – Solozano combination or the Tominaga– Forsberg – Wedellsborg – Jeter – Bunge – Solozano combination in further view of either Japanese Application Publication JP 2000-346993 to Takahiro or Japanese Patent No. JP11-311693 to Masataka.

Fig. 2 Has Been Revised To Resolve The Objection

The Office Action objected to Fig. 2 for showing the dry well being physically isolated from the pressure suppression pool, contrary to the specification and claim 1 language. Fig. 2 has been revised to show that the outer surface of the inner wall of the double-walled pressure containment vessel forms the inner wall of the toroidal-shaped pressure suppression pool while the outer wall of the pressure containment vessel form the outer wall of the pressure suppression pool as is explicitly shown in Fig. 10A and 11. Thus, the dry well and pressure suppression pool are in physical contact through a common boundary, namely the inner wall of the containment vessel. Applicants point out that claim 15 recites that the pressure suppression pool is formed outside the inner wall and inside the outer wall of the double-wall pressure containment vessel, which is consistent with the description on page 22 of the specification. Since the structure explicitly shown in Fig. 10A and 11 is being added to Fig. 2, no new matter is added by the drawing amendments.

Sp cification Paragraphs Hav Be n Amended T Address Th Objections

The individual specification paragraphs objected to by the Examiner have been amended to address the objections. The description provided in these paragraphs has been improved by rewording to remove ambiguity, by stating directly what was implicit in the paragraphs originally, and/or citing to the figures and describing in words what is present in the figures. Additionally, typographical errors have been corrected and sentences rewritten to improve clarity. Applicants have not introduced new matter into the specification by way of these amendments.

Applicants provide the following remarks in reply to specific paragraph objections:

Page 21, 2nd paragraph:

The Office Action objected to this paragraph for providing inadequate description of how the chimney effect is created in the reactor. This paragraph has been revised to include description of details shown in Fig. 6 to clarify how natural circulation flow is established within the reactor vessel and enhanced by the tall space above the core which provides the "chimney". Natural circulation of reactor coolant is a well known method for providing emergency and non-emergency cooling of nuclear reactor cores, so one of ordinary school in the art would understand the disclosure in the paragraph, as amended, and would know how to implement the disclosure to practice the claimed inventions without undue experimentation. Further, one of ordinary skill in the art would know how to readily determine the required flow rates based upon details of the reactor design to satisfy the accident design criteria. Finally, the chimney effect is not claimed.

Page 23, 1st Paragraph

The Office Action objected to this paragraph for mentioning "maintenance-free" control rod drive mechanisms and for stating that the fuel assemblies require no fuel replacement over 20 or more years. This paragraph has been revised to state that the control rod drive mechanisms are designed to "low-maintenance" specifications, which are typical design requirements for such reactor components. Further, the paragraph has been revised to state that the embodiment features control rods and fuel assemblies "designed" for long term operation. One of ordinary skill in the art would know the

design compromises that are required to design control rods and fuel assemblies for long-term operations (e.g., increase core size, fuel loading, burnable poison loading, etc.). Therefore, the paragraph provides sufficient disclosure to enable one of ordinary skill in the art to practice the claimed inventions. Finally, maintenance-free control rod drive mechanisms and 20-year life fuel cores are not claimed.

Page 23, Last Paragraph

The Office Action objected to this paragraph for not stating exactly where two isolation valves are provided with respect to the pressure containment vessel. The paragraph has been revised to clarify that the valves are outside of the pressure containment vessel. The exact location is a matter of design choice depending upon the configuration of the reactor, and a detail that one of ordinary skill in the art would know how to determine without undue experimentation. Further, the location of the two isolation valves is not claimed.

Page 24, 1st Paragraph

The Office Action objected to this paragraph for providing inadequate description for how and in what manner combining the reactor and turbine buildings into a single building achieves "mitigate[s] seismic design conditions." This paragraph has been revised to clarify that combining the equipment into a single building permits standardizing the design and the seismic countermeasures.

Page 24, 2nd Paragraph

The Office Action objected to this paragraph for providing inadequate description of how the pressure suppression pool is "disposed above the reactor core" when the figures show a portion of the pressure suppression pool below the top of the reactor core. This paragraph has been revised to describe what is in Fig. 2, namely that most of the pressure suppression pool volume is disposed above the reactor core. This paragraph has also been revised to clarify the description of the structure forming the pressure suppression pool by describing what is shown explicitly in Fig. 10A and 11 and described in words on pages 32 and 37-38.

Page 25, 1st Paragraph

The Office Action objected to this paragraph for providing inadequate description of the manner in which a loss-of-coolant accident is handled by the gravity driven core-cooling system. This paragraph has been revised to describe what is shown in the figures, namely the placement of the cut-off valve and check valve in the injection piping. Since core injection systems for handling loss of coolant accidents are well known in the nuclear reactor arts, one of ordinary skill in the art would understand the system based upon the description provided in the paragraph and would be able to readily determine the missing details (such as pool volume) cited in the Office Action based upon the design details of the particular reactor power plant (e.g., design power level, dry well volume, core volume, reactor pressure vessel volume, etc.). Therefore, the disclosure in the paragraph is adequate to permit one of ordinary skill in the art to practice the claimed inventions without undue experimentation.

Page 25, 3rd Paragraph

The Office Action objected to this paragraph for providing insufficient disclosure of the "authorities of severe accident countermeasures." This paragraph has been revised to replace "authorities" with "government-imposed requirements" which is the intended meaning.

Page 26, 1st Paragraph

The Office Action objected to this paragraph for providing inadequate description of how the molten core can be retained within the reactor vessel. This paragraph has been revised to clarify that the small volume of the dry well permits the well to be more rapidly filled with water for a given flow rate, enabling the reactor vessel to be covered and thereby cooled. One of ordinary skill in the art would recognize the ability of water surrounding the reactor vessel to cool the core material through the vessel and to keep the vessel metal below melting temperatures, and would be able to calculate the volume of water required to flood the volume of the dry well based upon the dimensions of the dry well. Thus, the disclosure in this paragraph, as amended, is adequate to permit one of ordinary skill in the art to practice the claimed inventions without undue experimentation.

Page 27, 3rd Paragraph

The Office Action objected to this paragraph for providing inadequate explanation of what is meant by the reactor being in an "isolated condition." This paragraph has been revised to add a parenthetical explanation that the phrase means the reactor is isolated from the main turbine and condenser, which is implicit from the disclosure in the specification and the figures and consistent with the customary understanding of that term in the nuclear power industry.

Page 31, Last Paragraph

The Office Action objected to this paragraph for not stating exactly the size of the fins within the double-walled structure of the containment vessel. Applicants submit that the disclosure in the paragraph, combined with the disclosure of the purpose of the fins (i.e., to enhance heat transfer for cooling of the containment vessel through convective flow of water) and the illustration in Fig. 10B is sufficient to enable one of ordinary skill in the art to determine the appropriate fin sizes based upon the specific design requirements of a particular reactor plant without undue experimentation. The appropriate fin sizes may depend upon many plant-specific parameters (e.g., design power level, containment vessel volume, design heat-sink temperature, etc.) such that there is not an exact fin size that should be implemented.

Page 34, 1st Paragraph

The Office Action objected to this paragraph for providing insufficient disclosure of the volume of molten core material expected in a severe accident, the highest temperature that the bottom of the reactor vessel will reach during the accident, the exact volume of water required in the suppression pool to prevent core melt-through, and how soon after the accident that water injection must begin. Applicants submit that these details are plant-specific, depending upon parameters that will vary from reactor to reactor, and easily determined by one of ordinary skill in the art in possession of such parameters. Consequently, the disclosure provided in this paragraph is sufficient to enable one of ordinary skill in the art to practice the claimed inventions without undue experimentation.

Page 34, Last Paragraph

The Office Action objected to this paragraph for failing to disclose how and in what manner connections between the dry well and the pressure suppression pool are located in order to create thermal convection flow. This paragraph has been amended to explain in words what is shown in Fig. 10A and 11, namely the manner in which thermal convection flow of cooling water is established between the dry well and the pressure suppression pool. The use of thermal convection flow (natural circulation) to provide passive cooling is a well known method for providing emergency and non-emergency cooling of nuclear reactor system, so one of ordinary school in the art would understand the disclosure in the paragraph, as amended, and would know how to implement the disclosure to practice the claimed inventions without undue experimentation. Further, one of ordinary skill in the art would know how to readily determine the required locations and piping sizes in order to ensure sufficient convective flow is established under the design accident conditions.

Page 36, 2nd Paragraph

The Office Action objected to this paragraph for providing inadequate description as to how and in what manner molten core cooling is accomplished. On of ordinary skill in the art would understand the disclosure in this paragraph and would be able to readily determine the dry well temperature at which dry well flooding must initiate in order to retain the molten core in the dry well, and would be able to readily identify a metal allow with a melting point in the range of that temperature. Therefore, Applicants assert that the disclosure in this paragraph, as amended, is sufficient to enable one of ordinary skill in the art to practice the claimed invention without undue experimentation.

The Specification As Amended Is Sufficient To Enable One Of Skill In The Nuclear Reactor Design Arts To Practice The Claimed Inventions

Applicants submit that the specification as amended, including the figures, is sufficient to enable one of ordinary skill in the art to understand the disclosure and to practice the claimed inventions without undue experimentation. The methodologies and engineering tools for sizing and designing reactor equipment, including reactor safety systems, are well known to one of ordinary skill in the art such that recitation of

detailed parameters and design methodologies is unnecessary to fully disclose and enable the claimed inventions.

Under 35 U.S.C. 112, first paragraph, the specification

> shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same....
>
> *Emphasis added*

The claimed inventions are directed to structure of a nuclear reactor, every feature of which is sufficiently disclosed in the specification and the drawings to enable one of ordinary skill to practice the invention. For example, new claim 15 is reproduced below with the structural references from the figures included to demonstrate where the structure is disclosed in the specification.

15. (New) A boiling water reactor nuclear power plant, in which a cooling water is circulated, in an installed state comprising:

a reactor building *(shown in Fig. 2)*;

a reactor containment vessel (401) positioned in the reactor building (*positioning shown in Fig. 2*), the reactor containment vessel having an inner wall *(401, 402, 403 and shown in Fig. 10A and 11)* defining an inside of the reactor containment vessel *(shown in Fig. 10A and 11)* and an outer wall defining an exterior of the reactor containment vessel *(shown in Fig. 10A and 11)*, wherein the inner wall and the outer wall are made from multiple steel plates;

a reactor pressure vessel *(201 and Fig. 6)* disposed inside the reactor containment vessel;

a dry well (231) defined by a portion of the inside the reactor containment vessel;

a pressure suppression pool (404) provided outside the inner wall and inside the outer wall of the reactor containment vessel, a wall of the pressure suppression pool being formed by a portion of the inner wall of the reactor containment vessel *(positioning and structure shown in Fig. 2, 10A and 11)*;

a reactor containment vessel cooling system pool (233) positioned in the reactor building and disposed above the suppression pool *(positioning shown in Fig. 2)*;

a reactor core (202) mounted with fuel assemblies supported by a reactor core support plate (204) and an upper grid plate (205) provided in an inner base portion of the reactor pressure vessel, at least a portion of said reactor core being disposed below said pressure suppression pool *(positioning shown in Fig. 2)*;

a reactor core shroud (shown in Fig. 7) surrounding the reactor core and the upper grid plate;

control rod guide tubes (213) positioned in the reactor core shroud and over the upper grid plate;

control rods (206) inserted in the control rod guide tubes; and

control rod drive mechanisms (235) for inserting and withdrawing the control rods from an upper portion of the reactor core *(shown in Fig. 5)*, said control rod drive mechanisms being arranged at a portion above the control rod guide tubes and inside the reactor core shroud,

wherein said reactor containment vessel inner wall and outer wall comprise a double-wall structure forming an inner hollow structure *(shown in Fig. 10b)* over at least a portion of the reactor containment vessel *(shown in Fig. 10A and 11)*, and wherein the inner hollow structure is provided with a plurality of ribs (203) and the inner hollow structure is in fluidic communication with the reactor containment vessel cooling system pool *(shown in Fig. 10a and 11)* so that a cooling water therein flows and circulates in the inner hollow structure to cool the dry well *(shown in Fig. 10a and 11)*.

Further, the Office Action objects to several paragraphs in the specification for not providing sufficient description of structures that are not recited in the claims. This includes the "chimney effect", combining the major components into a single building, maintenance free control rod drive mechanisms, and 20-year life fuel assemblies, which are not recited in the claims. Applicants nevertheless assert that the descriptions in these paragraphs, supplemented by the disclosure in the figures, are adequate to enable one of ordinary skill in the art to understand what is disclosed and to practice the claimed inventions.

Based on the amendments herein and the foregoing remarks, Applicants respectfully request withdrawal of the objections to the specification and withdrawal of the claim rejections under 35 U.S.C. § 112, first paragraph.

The Specification Is Adequate To Demonstrate Utility And Operability

Based upon the foregoing remarks, Applicants assert that the specification adequately describes the claimed invention to demonstrate their utility and operability to one of ordinary skill in the art sufficient to meet the requirements of 35 U.S.C. § 101. For one, the utility of a nuclear power plant and the claimed safety system is beyond question. For another, nuclear power plants and their safety systems are well known to operate as designed. Since the specification adequately discloses the claimed invention to enable it to be practiced by one of ordinary skill in the art, Applicants submit that the utility and operability of the claimed invention are established. Accordingly, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 101.

Claims 4, 5, 7 and 10 Have Been Amended To Resolve The Antecedent Basis Rejections

Each of claims 4, 5, 7 and 10 have been amended to resolve the rejections under 35 U.S.C. § 112, second paragraph. Accordingly, Applicants respectfully request withdrawal of these rejections.

The New Independent Claim 15 Recites Structure Not Previously Known And Not Disclosed Or Suggested In The Cited References

Applicants respectfully submit that one of skill in this art field would recognize the respective constitutional elements or equipments defined in the new independent claim 15 as being familiar or known as independent reactor safety system means—with the exception of the double-walled structure of the containment vessel discussed below—such that their disclosure in the specification is adequate to enable one of ordinary skill in the art to practice the claimed inventions without undue experimentation. However, the specific combination of the safety system recited in claim 15 has not been known, it would not be obvious to combine the cited references as stated in the Office Action, and even if the references are combined they still fail to disclose all elements of new claim 15.

In particular, the cited references do not disclose the use of the other recited safety systems in combination with a containment vessel having a double wall structure creating an inner hollow within which cooling water is circulated as part of the containment cooling system. Further, the plurality of ribs disposed within the inner

hollow structure of the containment vessel wall is also not disclosed or suggested in the cited references. Applicants submit that this structure, which transforms the containment vessel wall structure into a passive safety system capable of performing an emergency heat transfer function, is new and not disclosed or suggested in the cited references.

In this regard, the cited reference most relevant is the Wedellsborg patent which discloses multi-shell pressure vessels. However, Wedellsborg specifically teaches away from the configuration recited in new claim 15. Specifically, Wedellsborg teaches that the space between the pressure vessel shells can be filled with <u>insulating material</u> (Wedellsborg at col. 6, ll. 49-52; col. 7, ll. 7-9), Thus, Wedellsborg teaches away from "forming an inner hollow structure over at least a portion of the reactor containment vessel, and wherein the inner hollow structure is provided with a plurality of ribs and the inner hollow structure is in fluidic communication with the reactor containment vessel cooling system pool so that a cooling water therein flows and circulates in the inner hollow structure to cool the dry well " as recited in claim 15.

Applicants point out that the combination of top-entry control rod drive mechanisms in a boiling water reactor, which enables the core to be placed low in the reactor pressure vessel and a minimum volume dry well design, permits the double-walled containment vessel wall structure to function effectively as a PCCS. The use of this wall structure as part of the PCCS would not be cost-effective for conventional boiling water reactors and pressurized water reactors due to various design requirements known to those of skill in the art. For this reason, it is inappropriate to combine the various elements found in the several cited references to establish a case of obviousness because one of ordinary skill in the art would recognize that the suggested combinations would be inoperative.

Since the <u>structure</u> recited in new independent claim 15 is not disclosed in or rendered obvious by the cited references, Applicants submit that this claim is allowable over those references. Accordingly, Applicants respectfully request that new claim 15 be allowed.

Claims 2 – 13 Ar All wabl For Depending Fr m An Allowable Claim

Claims 2 – 13, as amended, depend from claim 15 which Applicants submit is in condition for allowance. Accordingly, Applicants respectfully request withdrawal of the rejections for claims 2 – 8 and 10 – 13 and allowance of claim 9.

The New Independent Claim 16 Recites Structure Not Disclosed Or Suggested In The Cited References

New independent claim 16 is directed to a containment vessel for use in a nuclear reactor, wherein the containment vessel has a double-walled structure that can be connected to cooling water. This claim is supported by the disclosure in the specification in Fig. 2, 10A, 10B and 11 and in the written description on pages 22, 24, 31-32, 34-35, and 37-38. As stated above, the cited references do not disclose a containment vessel having a double wall structure creating an inner hollow within which cooling water can be circulated as part of the containment cooling system. Further, the plurality of ribs disposed within the inner hollow structure of the containment vessel wall is also not disclosed or suggested in the cited references. Applicants submit that this structure, which transforms the containment vessel wall structure into a passive safety system capable of performing an emergency heat transfer function, is new and not disclosed or suggested in the cited references.

The only cited reference relevant to claim 16 is the Wedellsborg patent which discloses multi-shell pressure vessels. However, as discussed above, Wedellsborg teaches away from the configuration recited in new claim 16. Specifically, Wedellsborg teaches that the space between the pressure vessel shells can be filled with <u>insulating material</u> (Wedellsborg at col. 6, ll. 49-52; col. 7, ll. 7-9), Thus, Wedellsborg teaches away from "forming an inner hollow structure" with "a fluidic connection to the reactor containment vessel cooling system" as recited in claim 16.

Since the <u>structure</u> recited in new independent claim 16 is not disclosed in or rendered obvious by the cited references, Applicants submit that this claim is allowable over those references. Accordingly, Applicants respectfully request that new claim 16 be allowed.

Conclusi n

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

Date December 2, 2002

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EXHIBIT 1

MARKED UP VERSION SHOWING CHANGES MADE

Below are the marked up replacement paragraph(s) from the Specification

Page 21, 2nd paragraph:

Therefore, according to the present embodiment, since the reactor core 202 is placed in a bottom position in the nuclear reactor pressure vessel 201 and the control rod guide tubes 213 are disposed thereabove, a chimney effect is created.[, whereby stronger] The chimney effect enhances thermally driven natural circulation flow of water heated in the core 202 up into the region containing the control rod guide tubes 213 where the water cools and sinks to the bottom of the reactor vessel for reentry into the core 202 as illustrated in Fig. 6. Thus, the chimney effect increases the natural circulation flow rate that [circulating force] can be obtained. Hence, the characteristic features of the natural circulation type reactor can be [displayed] utilized to the maximum. Furthermore, since it is not necessary to provide re-circulation pumps, as in a conventional nuclear reactor pressure vessel, the composition of the nuclear reactor pressure vessel [becomes] can be made very compact, and significant economic benefits can be obtained by associated cost reductions.

Page 23, 1st Paragraph

Furthermore, the active devices disposed inside the dry well 231 [are] may be minimized [as follows. Firstly, as described above, the] by using a control rod drive system that comprises [an] upper entry type control rod drive mechanisms 211 which [is] are built into the nuclear reactor pressure vessel 201, thereby removing control rod drive system structure from the dry well. [and this] This embodiment also features control rod drive mechanism 211 [is] designed to [have] low-maintenance[-free] specifications and [become] control rods and fuel assemblies 206 designed to be used up over long-term operations (for example, 20 years or more). [, together with the fuel assemblies 206, there being no fuel replacement operation.]

Page 23, Last Paragraph

Two isolation valves for the pressure containment vessel 401 are provided [, as far as possible to the] outer side of the pressure containment vessel 401. A dry well sump 409 is provided in the lower portion of the dry well 231, and reactor sump 410 is

provided in a position further below the dry well sump 409. Consequently, drainage from the dry well sump 409 is able to transfer by the force of gravity [force] to the lower positioned reactor sump 410. Therefore, no active pumps such as sump pumps are provided inside the dry well 231.

Page 24, 1st Paragraph

In this way, by integrating buildings [having] that would otherwise have different seismic grades, such as a reactor building 221 and a turbine building or the like, into one building, the seismic design and construction design for the buildings can be performed together in one process, and turbines 222 and the piping or the like can be arranged together with this reactor building 221, in an integral way, on a foundation having an anti-seismic structure. Thereby, it is possible [to mitigate the seismic design conditions, whilst also reducing the structural design of the building, and hence it is possible] to achieve design standardization and rationalization.

Page 24, 2nd Paragraph

As described above and illustrated in the figures, the pressure containment vessel 401 has a dual-cylinder structure formed by an inner wall and an outer wall. As shown in Fig. 2, 10A and 11, the pressure containment vessel 401 comprises [comprising] a dry well 231 provided on the inner side of the inner wall and a pressure suppression pool 404 provided in a portion of the volume between the inner wall and the outer wall. [on the outer side, and this] As shown in Fig. 2, most of the pressure suppression pool 404 volume is [also] disposed above the reactor core 202 constituted by the fuel assemblies 206. A dry well flooding pipe 430 for injecting water from the pool into the dry well 231 under its own gravity in the case of an emergency, and a gravitational reactor core cooling water injection system pipe 234 for injecting water into the reactor core 202 are connected to the pressure suppression pool 404. Thereby, the pressure suppression pool 404 has a composition whereby the pool water contained therein also serves as a water source for a gravity driven core cooling system.

Page 25, 1st Paragraph

Supposing, for example, that a loss of coolant accident (LOCA) has occurred, then the gravity driven core cooling system pipe 234 injects water from the pressure

suppression pool 404 into the reactor pressure vessel 201 via a check valve and shut-off valve (shown in Fig. 3 connected to pipe 234), and the reactor core 202 is cooled by flooding, in such a manner that a more severe accident can be prevented from occurring.

Page 25, 3rd Paragraph

Furthermore, [since] as shown in Fig. 4, the present embodiment facilitates meeting [meets the permission requirements of the authorities of] government-imposed requirements concerning severe accident countermeasures[,] by having no nozzles, penetrations, or the like, for making piping connections[, are provided] below the elevation of the reactor core 202 in the nuclear reactor pressure vessel 201. The main pipes connected to the nuclear reactor pressure vessel 201 only comprise, as described above, the main steam pipe 215, the feed water supply pipe 216, and the emergency core cooling system pipe 217, which are located above the reactor core 202.

Page 26, 1st Paragraph

Therefore, it is possible to minimize the spatial volume of the lower portion of the dry well 231 surrounding the nuclear reactor pressure vessel 201, and since water can [be injected readily into] more rapidly fill this small space at a given flow rate, it is possible to achieve a structure which [easily] permits IVR (In-Vessel Retention) as a severe accident countermeasure. Namely, the retention of molten core material inside the nuclear reactor pressure vessel can be [easily] attained by rapidly flooding the dry well 231, thereby cooling the nuclear reactor pressure vessel 201 before fuel melt-through can begin and preventing the event from progressing. [Moreover, since] Thus, minimizing the spatial volume of the lower part of the dry well 231 [is minimized, it can] permits it to be filled with water [at a high speed] faster for a given flow rate. [, and moreover] Moreover, by supplying the water to the dry well 231 rapidly, even greater safety margins [efficiency] can be obtained.

Page 27, 3rd Paragraph

Moreover, an emergency condenser 225 is also provided. Steam from the nuclear reactor pressure vessel 201 is introduced into this emergency condenser 225 via an emergency condenser steam pipe 226, and is condensed in the emergency condenser 225. The resulting condensate is returned to the reactor core 202 via the

emergency condensed water pipe 227. Thereby, in cases where it is necessary to shut down the nuclear reactor in a safe manner, for instance, in transient condition in the nuclear reactor or the like, it is possible to shut down the nuclear reactor at high-temperature in an isolated condition (i.e., with the nuclear reactor isolated from the turbine and the main condenser).

Page 34, 1st Paragraph

Next, supposing a severe accident wherein the reactor core fuel melts and drops onto the base of the reactor pressure vessel, water will be injected into the reactor pressure vessel 201 from the gravity driven core cooling system pipe 234. [, but prior to this,] Also, the valve 235a will be opened, or melted by the temperature, and water [is] will be injected into the dry well 231 from the water injection pipe 235. [Thereby,] By flooding the dry well surrounding the reactor pressure vessel, the molten fuel [is] will be cooled through the pressure vessel wall and damage to the lower boundary region of the nuclear reactor pressure vessel 201 can be prevented.

Page 34, Last Paragraph

In other words, heat exchange is performed by constructing the walls of the pressure containment vessel 401 in a ship hull-type dual-steel-plate structure, and circulating cooling water via natural circulation inside these walls 402 having a dual-steel-plate structure, in order to cool the outer side of the pressure containment vessel 401. Furthermore, since the lower dry well 231 and the pressure suppression pool 404 are connected by means of a coupling pipe 430 at two points of different connection height, an upper point through which heated water from the dry well will flow and lower point through which cooler water from the pressure suppression pool will flow as shown in Fig. 10A and 11, [of different connection height,] then a thermal convection flow is created between the dry well 231 and the pressure suppression pool 404, and hence effective cooling can be performed.

Page 36, 2nd Paragraph

If a severe accident occurs and there is a melt down of the reactor core 202, the molten core material falling down from the lower portion of the nuclear reactor pressure vessel 201 to the base portion of the dry well 231[,] will raise the temperature in the

dry well 231. As the temperature in the dry well 231 rises, [then] the temperature of the low-melting-point metal 442 forming the seal means rises [and] until the metal melts. By so doing, water [is] will be discharged into the base portion of the dry well 231 under the force of gravity [force,] from the pressure suppression pool 404, [and] thereby cooling the molten core material and hence enabling the molten material to be sealed and held inside the pressure containment vessel 401. Moreover, by means of water flowing in the coupling pipe 441, [abnormalities] initiation of this water discharge, and thus the presence of the reactor core in the dry well, can be detected by the differential pressure meter 443.

In the Claims:

2. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein [said pressure suppression pool is positioned higher than said reactor core,] said pressure suppression pool being connected to said nuclear reactor pressure vessel by means of gravity-based piping through which the cooling water drops by gravity.

3. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein a piping and nozzles connected to said nuclear reactor pressure vessel are positioned above said reactor core.

4. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein a valve which can be [optionally] opened to an exterior of said reactor core shroud is provided at a position above said fuel assembly.

5. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein [walls of said pressure containment vessel are made from multiple steel plates having ribs,] the multiple steel plates [being] are mutually opposing in a separated fashion through the ribs[, and the spaces formed between the multiple steel plates are used as flow passages of water or air].

6. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein said pressure suppression pool and a lower portion of the dry well are

connected by means of a plurality of emergency opening passages at different elevational positions.

7. (Amended) The boiling water reactor nuclear power plant according to claim 5, wherein a normal use cooling system is connected to the [space regions formed between said multiple steel plates] inner hollow structure of the reactor containment vessel wall.

8. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein a normally-closed water discharge pipe is led from said pressure suppression pool into said dry well at the base region of said nuclear reactor pressure vessel, and said water discharge pipe is normally closed by a sealing device [while] , the sealing device [is] capable of being released in case of emergency so as to open said water discharge pipe.

9. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein a heat pipe capable of exchanging heat is provided at a portion between said pressure suppression pool and the lower region of said dry well.

10. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein [said pressure suppression pool is positioned on the outer side of said dry well,] a guard pipe is provided so as to extend from said dry well section to said pressure suppression pool, and valves and piping led from said nuclear reactor pressure vessel are accommodated in said guard pipe.

11. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein a turbine system is installed on an upper portion of the reactor building.

12. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein an extraction space capable of accommodating said nuclear reactor pressure vessel [to lift] is provided above the nuclear reactor pressure vessel in the reactor building.

13. (Amended) The boiling water reactor nuclear power plant according to claim [1] 15, wherein said reactor building is positioned on a foundation base having an anti-seismic structure.